WHAT IS CLAIMED IS:

1. An obstacle detection device in which at least two image pick-up devices each pick up an image of a preset common detection region, and which determines whether an obstacle is present or not in the detection region from the stereo images picked up using the image pick-up devices, the device comprising:

image input means for receiving the image from each of the image pick-up devices;

correspondence detection means for deriving a plurality of pairs of corresponding points in the detection regions of the received two stereo images;

slope degree calculation means for calculating a slope degree corresponding to a slope angle between a basic plane which is parallel to optical axes of the image pick-up devices and a detection plane including the derived plurality of corresponding points in the stereo images; and

result determination means for determining as there being an obstacle when the slope degree of the detection plane is larger than a predetermined value.

2. The obstacle detection device according to claim 1, wherein

the slope degree calculation means regards the slope angle as a pitch angle between the basic plane and the detection plane, and a parameter of an affine transformation matrix indicating a relationship between the corresponding points in the images

or a unique value derived from the parameter as a slope degree.

3. The obstacle detection device according to claim 2, wherein

the slope degree calculation means calculates the slope degree by solving an equation based on a parallax and vertical positions of the plurality of pairs of corresponding points.

4. The obstacle detection device according to claim 1, wherein

the slope degree calculation means calculates the slope degree by voting coordinate values of the plurality of pairs of corresponding points into a voting space based on an equation satisfied by the coordinate values.

5. The obstacle detection device according to claim 1, wherein

the slope degree calculation means detects, as an obstacle, out of the plurality of pairs of corresponding points, only the pair of corresponding points resulting in the slope degree large in value.

6. An obstacle detection method in which at least two image pick-up devices each pick up an image of a preset common detection region, and which determines whether an obstacles is present or not in the detection region from the stereo images picked up using the image pick-up devices, the method comprising:

an image receiving step of receiving the image from each of the image pick-up devices;

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a correlation detecting step of deriving a plurality of pairs of corresponding points in the detection regions of the two stereo images;

a slope degree calculating step of calculating a slope degree corresponding to a slope angle between a basic plane which is parallel to optical axes of the image pick-up devices and a detection plane including the derived plurality of corresponding points in the stereo images; and

a result determining step of determining as there being an obstacle when the slope degree of the detection plane is larger than a predetermined value.

7.   The obstacle detection method according to claim 6, wherein

in the slope degree calculation step, the slope angle is regarded as a pitch angle between the basic plane and the detection plane, and a parameter of an affine transformation matrix indicating a relationship between the corresponding points in the images or a unique value derived from the parameter is regarded as a slope degree.

8.   The obstacle detection method according to claim 7, wherein

in the slope degree calculation step, the slope degree is calculated by solving an equation based on a parallax and vertical positions of the plurality of pairs of corresponding points.

9. The obstacle detection method according to claim 6, wherein

in the slope degree calculation step, the slope degree is calculated by voting coordinate values of the plurality of pairs of corresponding points into a voting space based on an equation satisfied by the coordinate values.

10. The obstacle detection method according to claim 6, wherein

in the slope degree calculation step, out of the plurality of pairs of corresponding points, only the pair of corresponding points resulting in the slope degree large in value is detected as an obstacle.

11. A program for realizing, by computer execution, an obstacle detection method in which at least two image pick-up devices each pick up an image of a preset common detection region, and a determination is made from stereo images picked up using the image pick-up devices whether or not the detection region includes an obstacle, the program comprising:

an image input function for receiving the stereo images from the image pick-up devices;

a correspondence detection function for deriving a plurality of pairs of corresponding points in the detection regions of the received stereo images;

a slope degree calculation function for calculating a slope degree corresponding to a slope angle between a basic plane

which is parallel to optical axes of the image pick-up devices and a detection plane including the derived plurality of corresponding points in the stereo images; and

a result determination function for determining as there being an obstacle when the slope degree of the detection plane is larger than a predetermined value.

12. The program of the obstacle detection method according to claim 11, wherein

the slope degree calculation function regards the slope angle as a pitch angle between the basic plane and the detection plane, and a parameter of an affine transformation matrix indicating a relationship between the corresponding points in the stereo images or a unique value derived from the parameter as a slope degree.

13. The program of the obstacle detection method according to claim 12, wherein

the slope degree calculation function calculates the slope degree by solving an equation based on a parallax and vertical positions of the plurality of pairs of corresponding points.

14. The program of the obstacle detection method according to claim 11, wherein

the slope degree calculation function calculates the slope degree by voting coordinate values of the plurality of pairs of corresponding points into a voting space based on an equation satisfied by the coordinate values.

15. The program of the obstacle detection method according to claim 11, wherein

the slope degree calculation function detects, as an obstacle, out of the plurality of pairs of corresponding points, only the pair of corresponding points resulting in the slope degree large in value.

16. An obstacle detection device in which at least two image pick-up devices each pick up an image of a preset common detection region, and a determination is made from stereo images picked up using the image pick-up devices whether or not the detection region includes an obstacle, the device comprising:

an image input section for receiving the stereo images from the image pick-up devices;

a correspondence detection section for deriving a plurality of pairs of corresponding points in the detection regions of the received stereo images;

a slope degree calculation section for calculating a slope degree corresponding to a slope angle between a basic plane which is parallel to optical axes of the image pick-up devices and a detection plane including the derived plurality of corresponding points in the stereo images; and

a result determination section for determining as there being an obstacle when the slope degree of the detection plane is larger than a predetermined value.

17. A recording medium having recorded a program for realizing, by computer execution, an obstacle detection method in which at least two image pick-up devices each pick up an image of a preset common detection region, and a determination is made from stereo images picked up using the image pick-up devices whether or not the detection region includes an obstacle, the program comprising:

an image input function for receiving the stereo images from the image pick-up devices;

a correspondence detection function for deriving a plurality of pairs of corresponding points in the detection regions of the received stereo images;

a slope degree calculation function for calculating a slope degree corresponding to a slope angle between a basic plane which is parallel to optical axes of the image pick-up devices and a detection plane including the derived plurality of corresponding points in the stereo images; and

a result determination function for determining as there being an obstacle when the slope degree of the detection plane is larger than a predetermined value.